A.R.G.O.S.

The Augmented Reality

Graphical Operating System

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What is Augmented Reality?

- **"*Augmented reality* (AR) is a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by *computer-generated* sensory input such as sound, video, graphics or GPS data. It is related to a more general concept called *mediated reality*, in which a view of reality is modified by a computer. As a result, the technology functions by enhancing one's current perception of reality."*

- *"By contrast, *virtual reality* replaces the real world with a simulated one."*

  -Wikipedia.org

- Early examples of Augmented Reality include Heads-Up-Displays for Fighter Jets, CCTV Video Surveillance, and even looking through a digital camera lens.

- Think of it as sci-fi holograms made with cameras and computer simulations!

Project Overview and Purpose

• The Augmented Reality Graphical Operating System is a game concept that explores the use of AR within games.

• The prototype uses open-source programming, with emphasis on Java.

• It is capable of projecting fully textured 3D objects over a real-time video feed, much like a the holograms seen in science fiction.

• ARGOS was designed in response to the current trends in AR technology.

• More video game companies and hardware manufacturers are creating AR-capable machines and programs, such as the Nintendo 3DS or the PSVita.

• We want to be on the forefront of this trend!

Phase 1

- Started out as a navigational augmented reality game. It guided the player through Building III on the Shady Grove campus.

- The player's body acted as the controller in real space.

- A 3D map displayed on the screen to show the player's current location.

- Used AR markers, which were placed in a variety of locations (cafeteria, library, etc.). Once a marker was scanned, time was added to the timer and the next objective appeared.

- The player had to get to each location before time ran out.

- The order of the missions was randomized. This served to increase replay value.

Phase 1 Results

After having to replace the library to fix the export issue and make a major user interface overhaul, Phase 1 was successfully completed!

Phase 1 Issues and Limitations

- System was limited to a VR-style goggles setup with video connections via laptop running Phase 1.

- System only worked with personal computers (Windows 7 and Ubuntu Linux 11.04)

- System had no sound effects; interaction was purely visual.

- Screen resolution was limited to 1024 x 768 due to hardware limitations.

- Due to the amount of memory needed, the system ran slower in lower footprint devices.

- System was not a complete game; there had to be major work done before we could consider this prototype " a game"!

Phase 2

- After the success of Phase 1, Team ARGOS began updating, expanding, and perfecting the prototype.

- The effort became known as Phase 2.

- Phase 2 added a more interactive user interface by having the player gesture with the markers on the menu.

- The new program interface is fully capable of marker-based gesture recognition.

- The new prototype was designed as a mission-based FPS, which implemented shooting missions to give the project a more traditional game experience.

- Phase 2 has audio to give the player a more complete experience.

- Overall, Phase 2 is a lot more fun than Phase 1!

Phase 2 Issues and Limitations

- Originally, Phase 2 was going to feature color-tracking and markerless AR.

- Color-tracking system was to replace AR markers and aid in gesture recognition.

- With this technique, Michael tried to create a system that simulates all of the possible positions of the color markers.

- It would have used 21.5 **TRILLION** bytes. That's 21.5 **TERABYTES**!

- Phase 2 was redesigned to use AR markers instead of the color markers. Thus, color tracking was dropped.

- We were able to preserve gesture recognition.

- Video converter was replaced by an HDMI converter; the resolution had to be changed from 720 x 480, to 1280 x 720.

- All HUD overlays and button position data had to be changed.

- Processing 1.2.1 kept crashing during testing.

Improvements from Phase 1

After many difficulties and a difficult crunch schedule, Phase 2 was successful! Here are some of the huge improvements ARGOS has received:

- The user interface is more visually appealing and extremely intuitive to navigate.

- There is now sound, which improves the overall experience of the player.

- Phase 2 runs at a much higher resolution than the previous prototype, with a much better camera resolution (1280 x 720).

- Phase 2 also features new 3D models, which are fully textured.

- AR Marker system has greatly improved since the last phase; less confusion.

Introducing: PHASE 2!

The Future of ARGOS

- The video game industry is shifting toward AR applications. This can be seen in everything from mobile phones to dedicated video game systems (the handheld Nintendo DS system, the Xbox 360 console's Kinect, etc.).

- AR has many applications. As stated earlier, we had originally created a navigational game. Now players have the ability to use hand motions to move and fire a ray gun. It's more than just a fad or trend.

- Aside from games, AR can also be used within simulations. For instance, medical students can practice procedures on their own or when they don't currently have access to a lab or tools.

- AR can be an invaluable teaching tool. A great example of this would be instructing a person on how to communicate in sign language.

- Markers can be used in presentations to easily show concepts of models in 3D, which would be extremely useful within several fields, including, but not limited to, architecture, car design, fashion design, and CG character design.

- The technology is new, and thus, has a lot of untapped potential!

Final Thoughts

- Though The Augmented Reality Graphical Operating System is successful, there is much more we can do.

- We are on the verge of a revolution in game design, where the game interface is no longer limited a 2-dimentional screen and buttons on a game pad.

- With augmented reality, we can finally bridge the gap between real life and video games, allowing people to overlap their reality with a new one!

- With augmented reality, what was once impossible to replicate in video games can now be done!

References

- LINKS:

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- FingARtips - http://ir.canterbury.ac.nz/bitstream/10092/350/1/12591625_2004-Graphite-Fingartips.pdf

- GAMEPLAY VIDEO LINKS:

- ARGOS: The Augmented Reality Graphical Operating System v3.2 - http://www.youtube.com/watch?v=WuaPjjsGg78&feature=relmfu

- **ARGOS Phase 2 BETA Gameplay -** http://www.youtube.com/watch?v=Otc8_Ah-LmM&feature=youtu.be